Tributary volumetric flux estimates

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These slides were presented at the Wood River Valley Modeling Technical Advisory Committee meeting Thursday, 03Oct2013, 10am-4pm at the Community Campus, Rm 200, in Hailey. Taken outside the context of the original presentation, these slides may not provide a complete or accurate representation of the speaker's intent.

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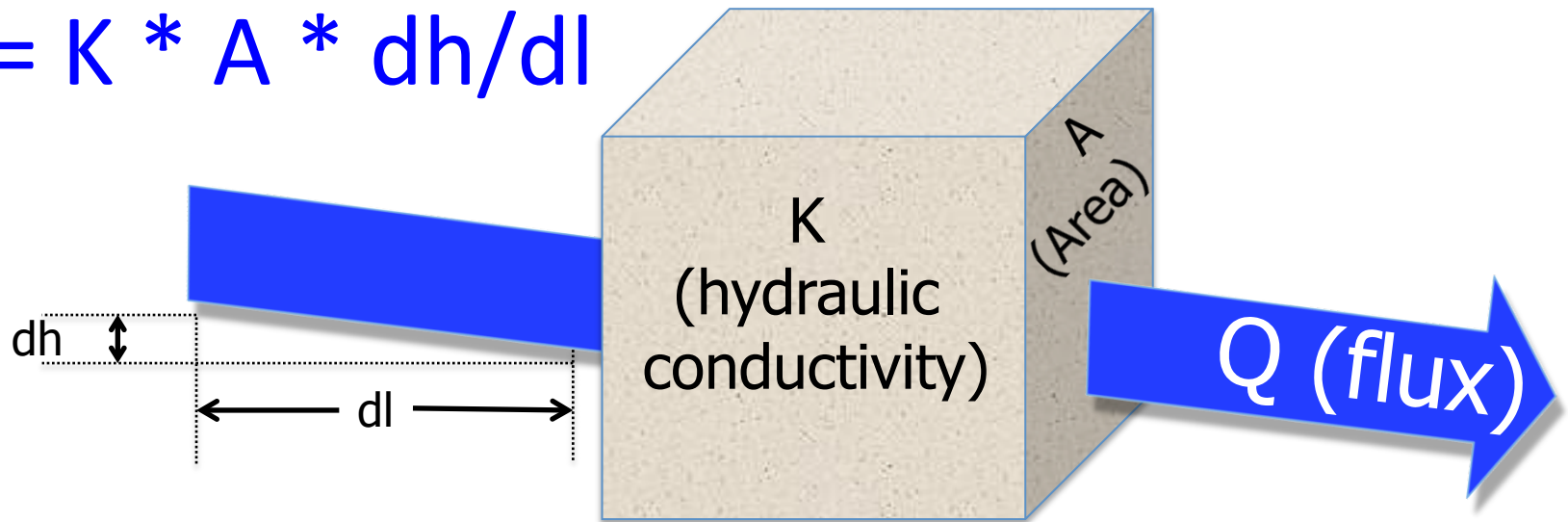# Problem: Representation of subsurface tributary inflow

❖ Subsurface flow from tributary canyons into the aquifer system is difficult to quantify with any certainty

❖ Possible approaches:
- Constant head: not a realistic representation
- Darcy equation:
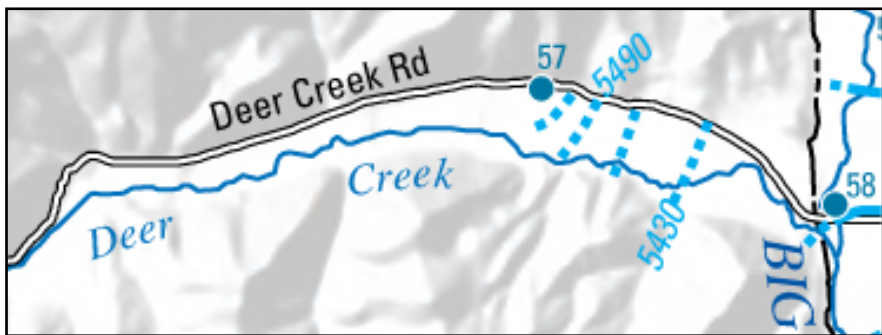 $Q = K * A * dh/dl$
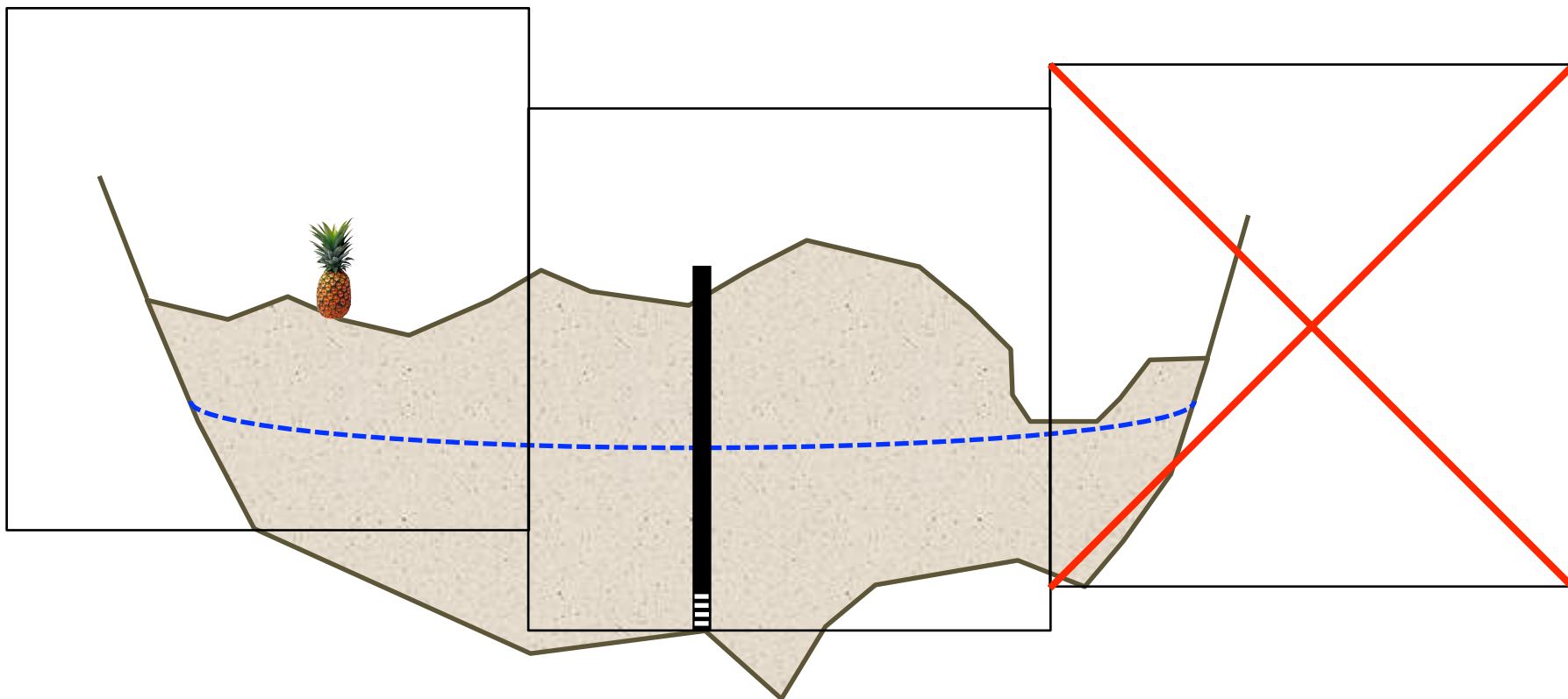
Darcian flux

$$Q = K * A * dh/dl$$

- ❖ Units:
  - Q = length^3 / time
  - K = length / time
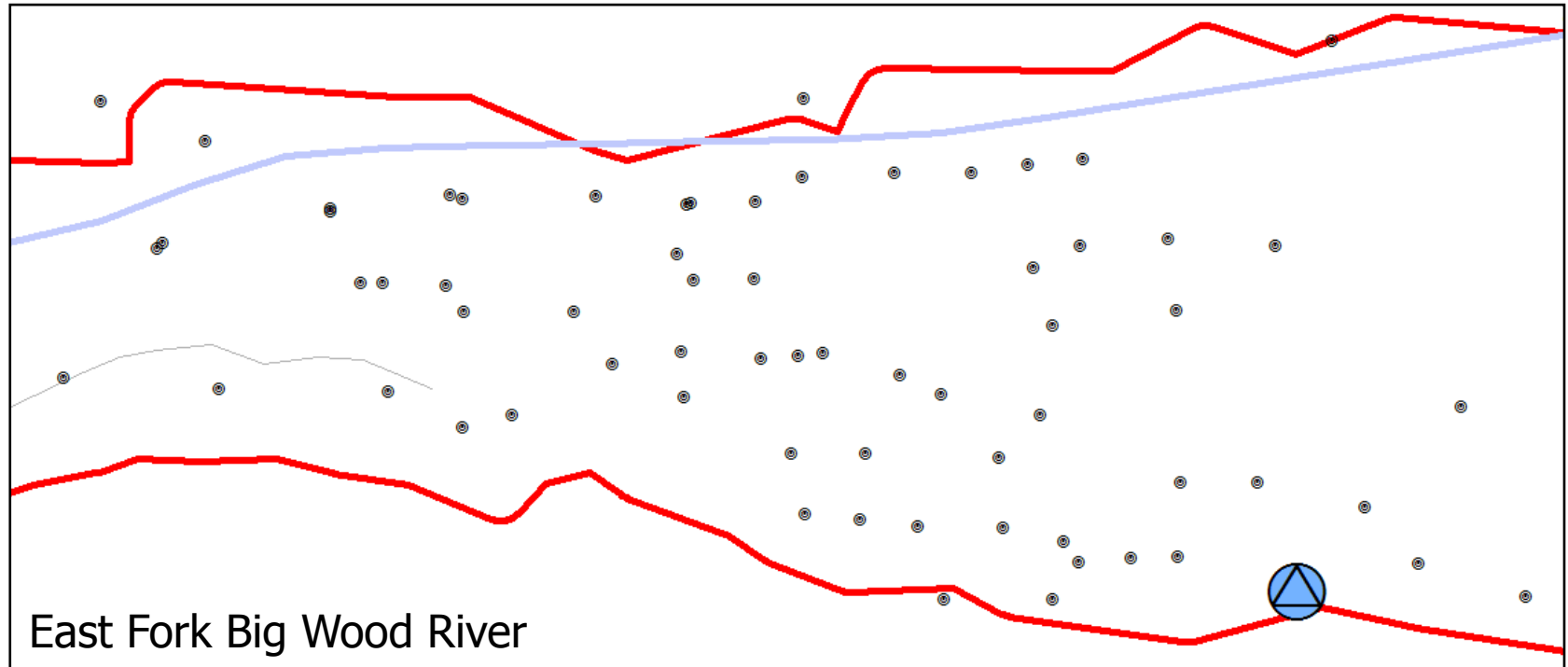 - A = length^2
  - dh/dl = length/length = dimensionless

- ❖ What values do we use for cross sectional area and gradient?

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Model cells and 2006 water-level map

❖ Not a good representation

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Another approach

East Fork Big Wood River
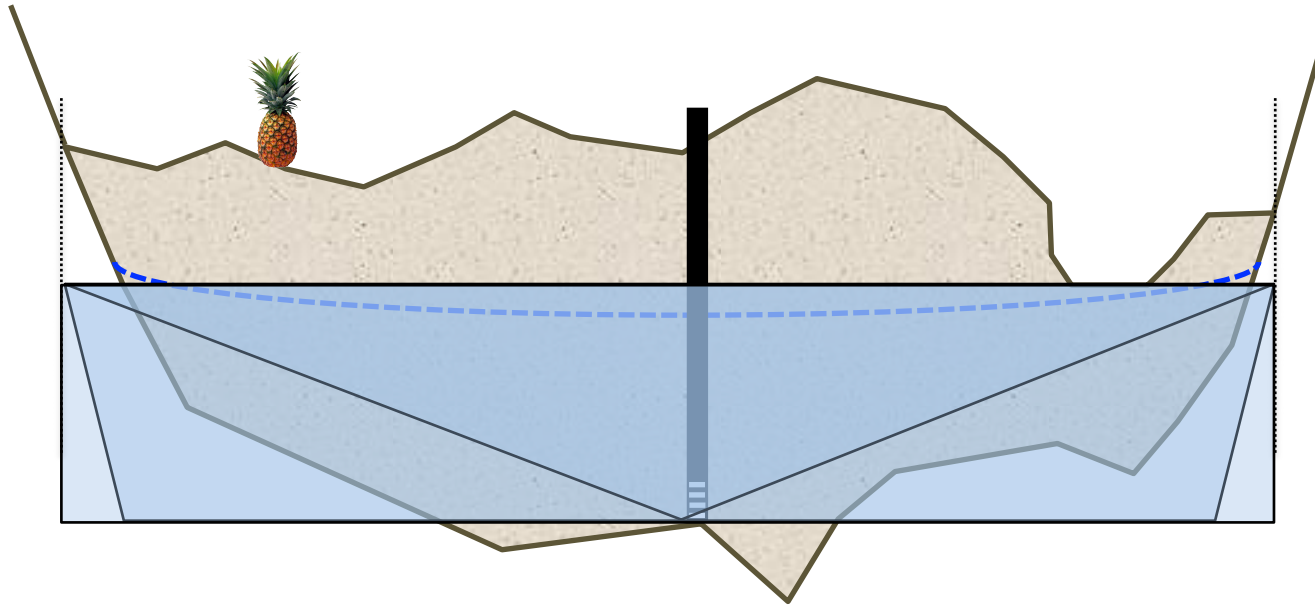
- ❖ Use drillers' logs for depth
- ❖ Water levels are still problematic: different dates
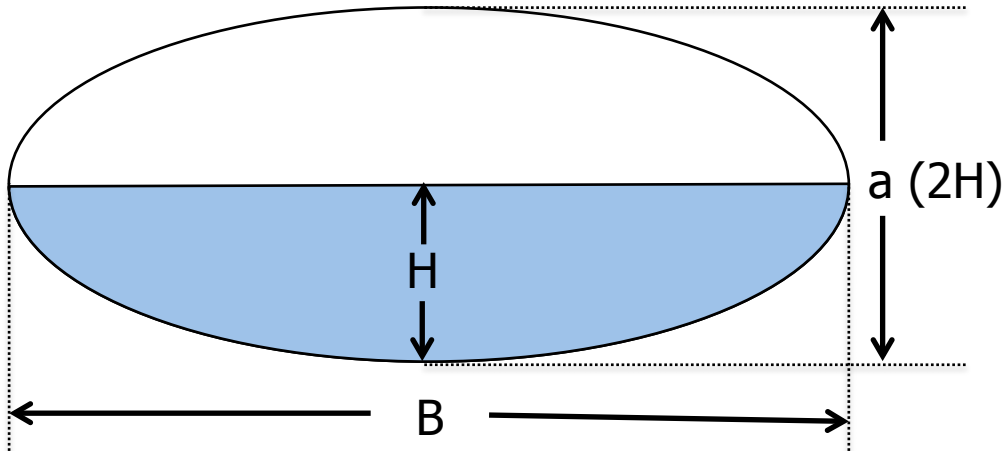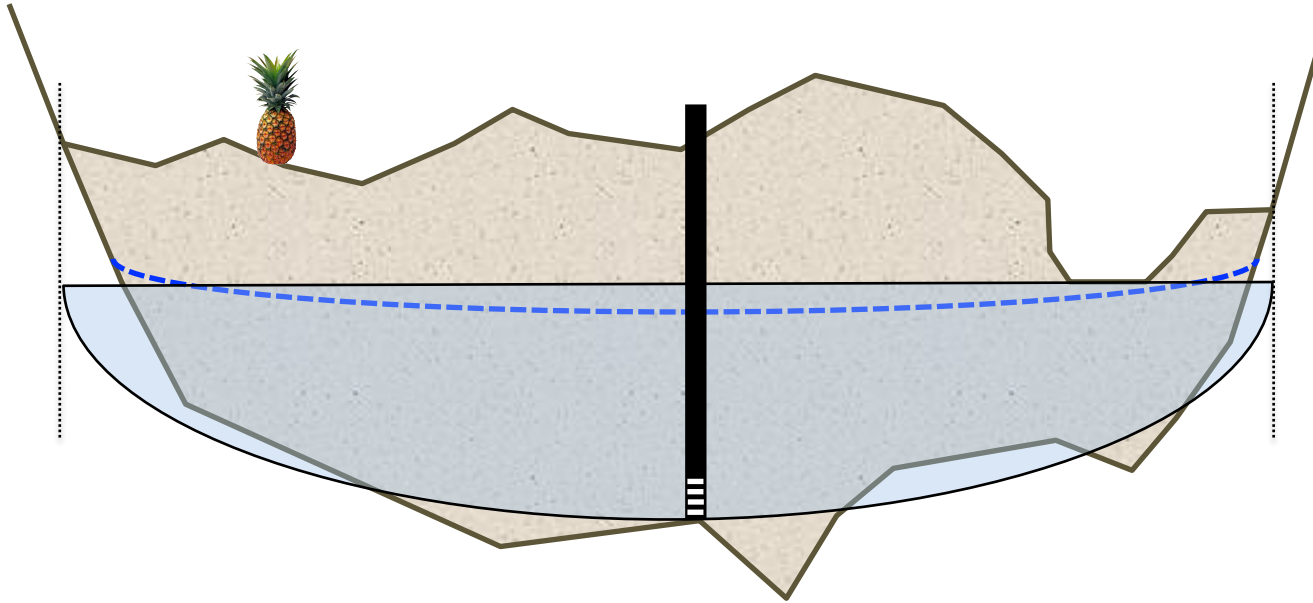
- ❖ Which shape for cross-sectional area?

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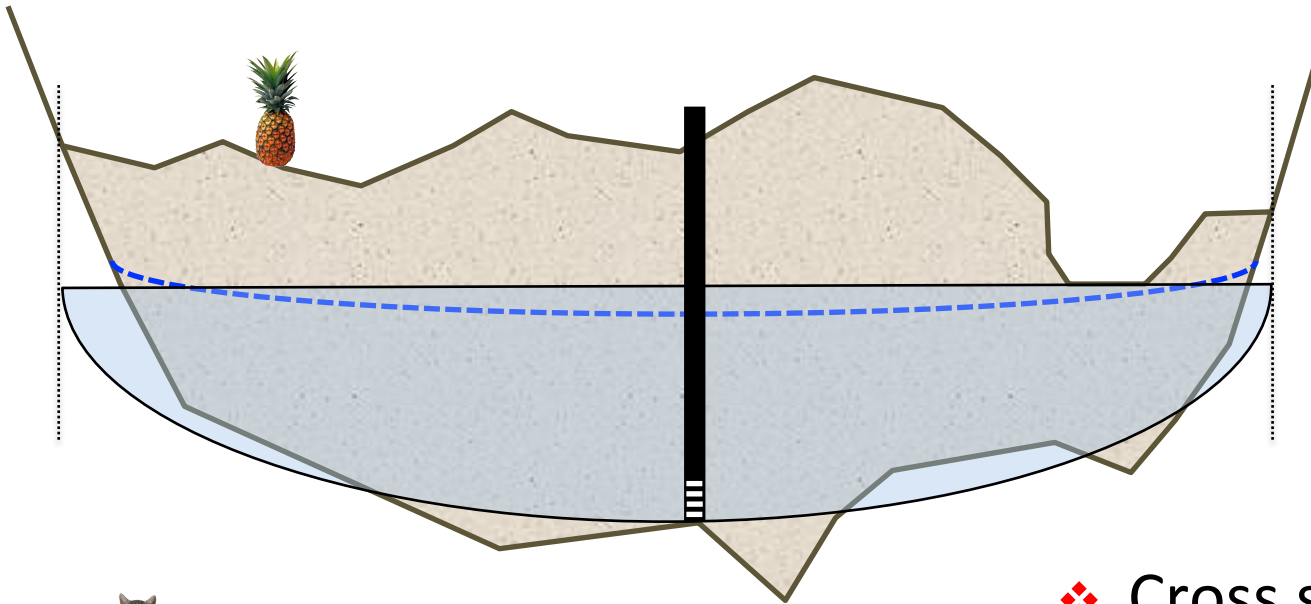# Cross-sectional area: Polygons

❖ Considering the uncertainty in depth and width, it may not make much difference

❖ However…

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Cross-sectional area: Ellipse segment
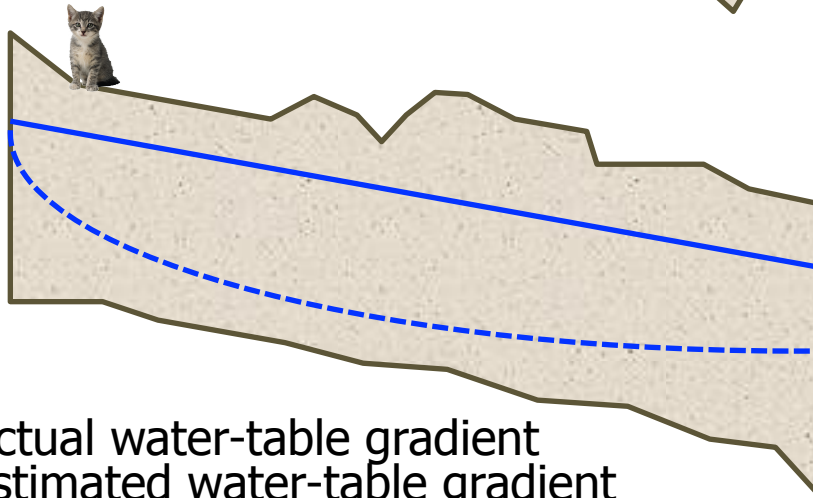

a (2H)

H

B

❖ Where is the top of the water table and what is the gradient?

Other assumptions

Actual cross section
Estimated cross section

Actual water-table gradient
Estimated water-table gradient

❖ Cross section:
- The water table is flat
- Intersects the lowest altitude (stream)

❖ Gradient:
- The water table is roughly parallel to the land surface

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Example: East Fork

East Fork Big Wood River
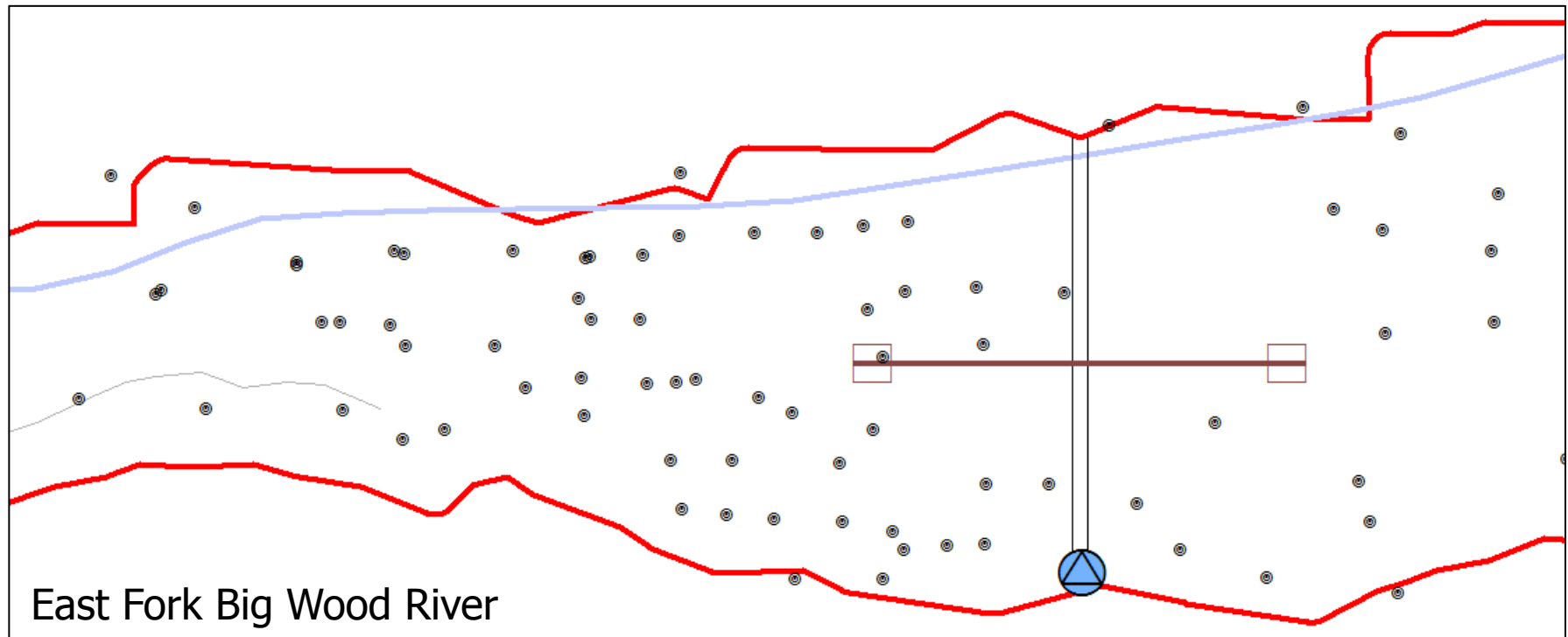
❖ Used GIS:

- Manually drew cross section and determined:
  - ➤ Length
  - ➤ Lowest point

- Generated a gradient line perpendicular to and same length as the cross section and determined:
  - ➤ Average slope

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Example: Lake Creek

Lake Creek

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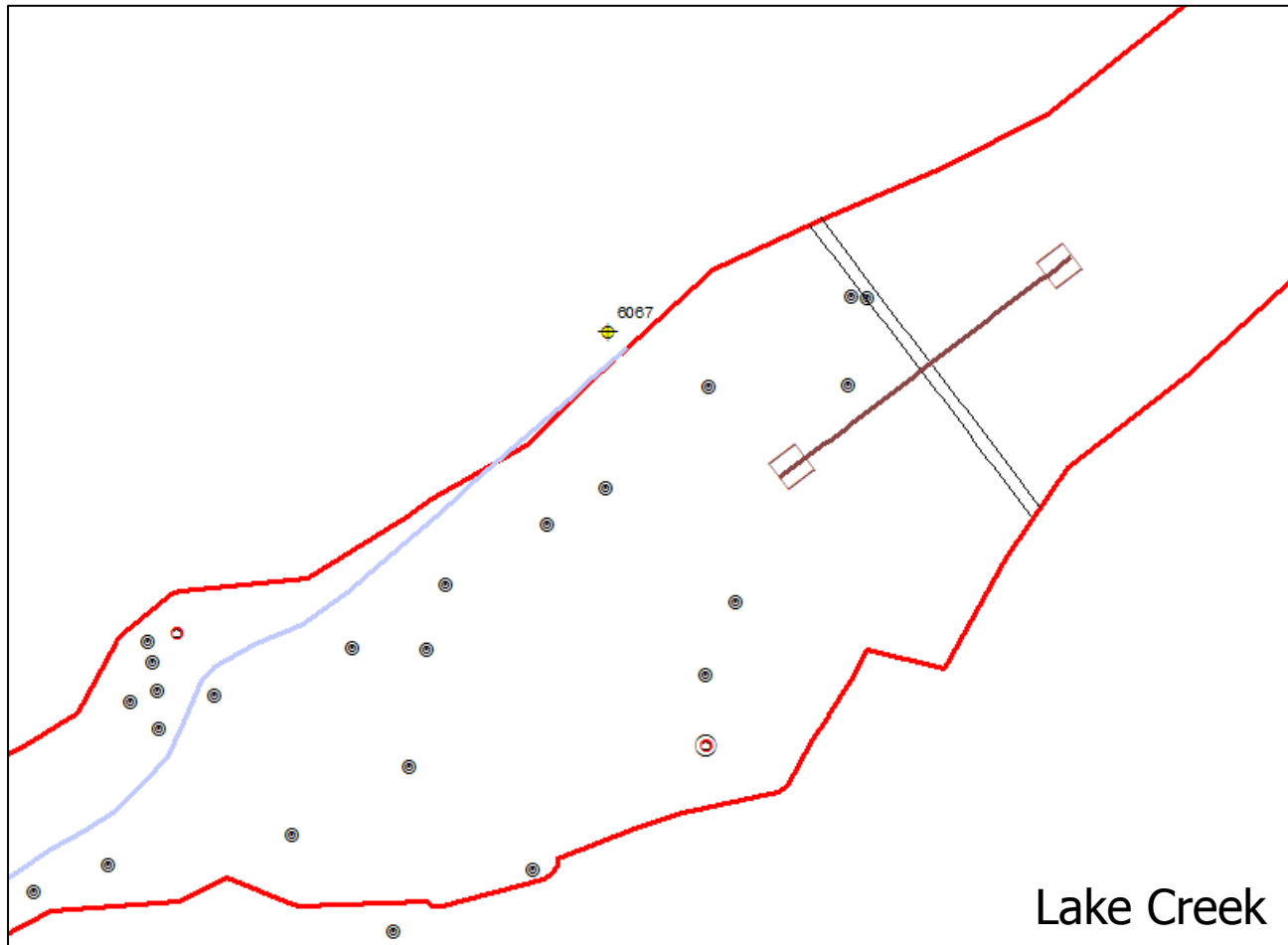
Example: Chocolate Gulch

Chocolate Gulch

❖ Smaller tributaries showed more underflow than total precipitation in drainage

❖ No data: what now?

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Flux estimates for small basins

❖ Used StreamStats for basin area and average precipitation to derive maximum basin yield

❖ Darcian flow overestimated for basins less than 10 mi^2

- Chocolate
- Clear Creek
- Cold Springs
- Ohio
- Lees
- Townsend

❖ Determined mean ratio of Darcian flux to maximum basin yield for larger basins: 0.06

❖ Applied this ratio to smaller basins to estimate volumetric flux

❖ Draft Design Document prepared

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Estimated flux (preliminary)

Tributary	Underflow (acre-ft/yr)	Underflow (ft³/s)	Gaged mean daily flow (ft³/s)
Trail Creek	2,900	4.0	42
Indian Creek	2,400	3.3	--
Lake Creek	2,400	3.3	--
Seamans Creek	1,900	2.6	--
Deer Creek	1,500	2.1	--
Eagle Creek	1,000	1.4	--
Adams Gulch	850	1.2	--
Croy Creek	700	1.0	--
Greenhorn Gulch	680	0.94	--
Quigley Creek	560	0.77	--
Slaughterhouse Gulch	510	0.70	--
Warm Springs Creek	490	0.68	85
East Fork Big Wood River	470	0.65	48
Ohio Gulch	260	0.36	--
Cold Springs Gulch	200	0.28	--
Clear Creek	140	0.19	--
Cove Canyon	140	0.19	--
Lees Gulch	130	0.18	--
Townsend Gulch	58	0.080	--
Chocolate Gulch	52	0.072	--
Elkhorn Gulch	51	0.070	--
Total:	17,000	24	--

❖ Questions or thoughts?

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